

UNITED STATES PATENT APPLICATION

of

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for a

ROPE AND WEBBING PROTECTOR

This application claims priority to U.S. Ser. No. 10/226,720 filed August 23, 2002 and U.S. Ser. No. 10/326,530 filed December 19, 2002, both of which claim priority to U.S. Provisional Application Ser. No. 60/352,637 filed January 31, 2002.

5 BACKGROUND

The invention relates to ropes and webbing for use in a wide variety of applications, and particularly relates to devices for protecting such ropes and webbing during use.

Ropes and webbing are used for myriad applications, including for example,  
10 safety and rescue, military uses, aviation, boating, camping and climbing as well as wide variety of household uses. Although ropes and webbing are generally designed to bear a variety loads, it is well known that a rope is only as strong as its weakest area. If, for example, an area becomes contaminated by dirt and grit, abraded, or even frayed, the rope or webbing may become weakest in that area and may wear out more quickly. Both  
15 the contamination by dirt and grit as well as the abrasion result in a reduction in strength and reliability of the rope in the area of contamination and/or abrasion.

Frequent replacement of ropes and webbing is an effective but costly solution to this problem. Other options include the use of a material that becomes fixed to the rope or webbing, such as by shrink wrapping or clamping. Such materials, however, may not  
20 be easily moved or adjusted, and may not provide sufficient protection during use if the rope or webbing moves against an abrasive surface while carrying a load.

There is a need, therefore, for an improved protector for protecting ropes and webbing. There is a further need for a rope and webbing protector that is efficient and economical to produce and relatively easy to use.

## 5 SUMMARY OF THE INVENTION

The invention provides a protector for protecting an elongated portion of rope or webbing. In an embodiment, the protector includes a flexible material that is formed in a spiral or wrapped position along the length of the flexible material.

## 10 BREIF DESCRIPTION OF THE DRAWINGS

The following description may be further understood with reference to the accompanying drawings in which:

Figure 1 shows an illustrative isometric view of a rope protector in accordance with an embodiment of the invention;

15 Figure 2 shows an illustrative end view of the rope protector shown in Figure 1;

Figure 3 shows an illustrative isometric view of the rope protector shown in Figure 1 being wrapped around a rope;

Figure 4 shows an illustrative isometric view of the rope and rope protector shown in Figure 3 with the rope protector fully wrapped around the rope;

20 Figure 5 shows an illustrative isometric view of rope protectors in accordance with various embodiments of the invention being used on top ropes at a rock climbing site;

Figure 6 shows an illustrative isometric view of protectors in accordance with various embodiments of the invention being used in a marine application;

Figure 7 shows an illustrative isometric view of a rope protector in accordance with a further embodiment used in a marine application;

5        Figure 8 shows an illustrative isometric view of another rope protector in accordance with another embodiment used in a marine application;

Figure 9 shows an illustrative sectional view of a rope including an attached rope protector of another embodiment of the invention during use and being subjected to a drag in a direction transverse to the longitudinal direction of the rope;

10       Figure 10 shows an illustrative side view of a coil of rope including a rope protector of another embodiment of the invention;

Figure 11 shows an illustrative sectional view of a protector of another embodiment of the invention used to protect webbing;

15       Figure 12 shows an illustrative sectional view of a protector of another embodiment of the invention; and

Figures 13A - 13C show illustrative sectional views of protectors in accordance with further embodiments of the invention.

The drawings are shown for illustrative purposes and are not to scale.

## 20    DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

As shown in Figure 1, in accordance with an embodiment, the invention provides a protector 10 that is formed of a flexible material that is formed in a spiral position along its longitudinal direction L. The material may be heat settable, or may be formed by a

variety of processes including molding or extrusion in various embodiments. The flexible material should be formed to have memory in the spiral shape (such as by heat setting) in accordance with an embodiment of the invention. The protector may be wrapped around a rope or webbing of various sizes and shapes with sufficient overlap  
5 that the rope or webbing will be protected from dirt, cutting, and abrasion over the length of the protector 10, especially when pulled or dragged over a sharp or rough surface. The material is formed or heat set to a diameter A as indicated in Figure 2 such that the formed spiral material will have memory in the spiral position. The diameter A should be smaller than the ropes and webbings on which the protector will be used such that when  
10 wrapped around them it will fit snugly over the ropes and webs along the full length of the protector 10 with sufficient gripping force as to avoid slippage along the length of the rope or webbing. The features of protection and non-slippage are maintained even when the rope or webbing is bent or twisted and/or when dragged or rolled along a rough, hard surface. The device is easy to use, light weight, tight fitting, abrasion resistant, low in  
15 cost, and adaptable to ropes that may range in sizes from, for example, about 0.8 cm to about 2.5 cm in diameter and webbing that may vary from, for example, about 1 cm to about 3 cm in width.

In particular, as shown in Figure 2, the protector 10 is formed by heat setting the flexible material in a spiral shape such that one elongated edge 12 is wrapped inside the  
20 spiral while the opposing elongated edge 14 is wrapped outside the spiral. As shown at 16 the material wraps around itself at least once, and may even wrap around itself about 2 to 2 ½ times as shown in Figure 2.

The protector 10 may be formed of a urethane having a thickness of about 0.1 cm to about 0.2 cm, a width of about 5 cm to about 20 cm, and may have a length of about 35 cm to about 80 cm in accordance with various embodiments. The protectors should have a sufficient number of overlapping wraps such that when expanded over the largest size  
5 rope or webbing there will still exist sufficient overlap of the spiral to completely envelope and protect the rope or webbing even when they are severely bent and twisted. In further embodiments the protector may be formed of a wide variety of materials including without limitation, a variety of polymeric and/or elastomeric materials including rubber, neoprene or a silicon elastomer. The material should have excellent  
10 memory in certain embodiments such that when twisted, expanded, or distorted it will substantially, if not completely, return to its original configuration when left in a free state. When wrapped around a rope or webbing larger in size than its free inside diameter, the spiral will try to return to its original inside diameter and in the process wrap snugly on the rope or webbing with sufficient force along its entire length as to  
15 preclude slippage along the length of the rope or webbing and to resist being unwrapped when slid sideways along a rough, hard surface in a direction transverse to the length of the spiral part.

For example, as shown in Figures 3 and 4, the protector may be wrapped around a rope 18 having a diameter B that is at least as large as the free diameter A of the  
20 protector. Even if the outer edge of the spiral is forced open by the sliding actions, there is sufficient redundant overlap within the spiral to provide full coverage of the rope or webbing. Assembly of the protector 10 onto the rope 18 requires the spiral protector 10 to be opened up as shown in Figure 3. While holding edge 12 against the rope 18, edge

14 is brought over edge 12 and rotated over edge 12 and around rope 18 until it is fully wound over its length L as shown in Figure 4. At this point, the elastic memory of the material used to construct the protector 10 will cause it to contract evenly around the rope 18 as shown in Figure 4. The rope diameter B is larger than the original inside diameter A of the protector 10 thus preventing the protector 10 from returning to its original size. The protector 10 will fit snugly onto the rope 18 with a small constricting force around its entire inside diameter and along its entire length. As a result of this force the protector 10 will hold itself in place on the rope 18 and not slide along the rope 18 unless pushed with a force as indicated at C in Figure 4. Typically, force C might result from a person's fingers pushing the protector 10 lengthwise along the rope 18 to whatever location is desired. It should be pointed out that the protector 10 may be wrapped around rope 18 in reverse with the edge 14 against the rope 18 and edge 12 on the outside. However, the constricting force previously described will be slightly diminished.

There may exist such a high degree of friction between the protector and the external environment that the device will allow for natural stretching and/or sliding of a weighted rope/webbing through the center of the protector, yet still remain stationary with respect to the external lying surface. For example, as shown in Figure 5, a first protector 20 may be applied to a rope 22 that is itself secured to a tree 24 at the top of a climbing wall 26. The rope 22 may be permitted to stretch or move slightly within the protector 20 if the friction between the outer surface of the protector 20 exceeds the friction between the rope 22 and the inside surface of the protector 20. The rope 22 may be used to support a climbing safety rope 28 together with a backup rope 30 that is attached to an anchor 32 as shown. The rope 30 may also include one or more protectors

34 and 36, particularly if the area to be covered at the top edge of the climbing wall requires more protector length as shown. In particular, the protectors may be placed in tandem with any number of additional protectors with slight end to end overlap (as shown at 38) for situations requiring protection of a length of rope/webbing greater than what a  
5 single protector could cover.

In further embodiments, a protector of the invention may be used in marine applications. For example, the protector shown in Figures 3 and 4 may be wrapped around a dock line having a diameter B that is at least as large as the free diameter A of the protector as shown in Figures 6 - 8. Even if the outer edge of the spiral is forced open  
10 by a sliding action, there is sufficient and redundant overlap within the spiral to provide full coverage of the rope or webbing. Assembly of the protector onto the line may be achieved as discussed above with reference to Figures 3 and 4.

In particular, as shown in Figure 6, a first protector 40 may be applied to a first dock line 42 that is itself secured between a boat 44 and a first dock cleat 46 on a dock  
15 48. The line 42 may be permitted to stretch or move slightly within the protector 40 if the friction between the outer surface of the protector 40 exceeds the friction between the line 42 and the inside surface of the protector 40. A second dock line 50 may be used together with a second protector 52 (adjacent the deck cleat 54 on the boat), a third protector 56 (adjacent the edge of the dock 58), and a fourth protector 58 (adjacent a  
20 second dock cleat 60). In further embodiments, protectors may be used end to end on a single line or sheet, and may overlap one another at their ends, or be used in mooring lines away from a dock.



The protectors are preferably used at locations on ropes where the rope is subjected to concentrated forces over dirty and/or abrasive surfaces such as at the edge of a cleat or dock. As shown in Figure 7, a protector 62 may be wrapped around a dock cleat 64 such that the protector 62 protects the line 66 against abrasion with respect to the cleat 64 itself as well as the dock 68. As shown in Figure 8, a protector 70 may be wrapped around a sheet 72 such that the protector 70 protects the sheet 72 against abrasion with respect to a sheet cleat 74 on a boat 76.

The lines and sheets that may be protected by the protectors therefore, are those that must withstand abuse such as from abrasion under hostile conditions, e.g., cold weather and salt air/water. If the line or sheet is swung thru an arc adjacent a rough edge, the protector along with enclosed line or sheet may be dragged sideways along rough edge resulting in the protector being subjected to dirt and abrasion while the enclosed lines are fully protected. In particular, the dragging action may cause an outside edge of the a protector 82 to be pulled out and away from the spiral of the protector 82 when dragged in a direction as indicated at D in Figure 9. There are sufficient overlapping turns in the protector 82 to keep the line or sheet 84 fully covered and protected from the abrasive edge 86 as shown in Figure 9.

In certain applications where the protectors are applied to a line for an extended period of time, such as for use with mooring lines, the protector may further be attached to the line by use of a plastic locking tie-wrap or marine adhesive tape.

The protectors are preferably used at locations on ropes where the rope is subjected to concentrated forces and/or over dirty or abrasive surfaces. The protector may be wrapped around the rope at one location away from area of interest (e.g., the edge

of a rock ledge or a building) and then slid via force C (as shown in Figure 4) along the rope to an area of interest. A downward force from a load (such as from a rock climber hanging on a rope) typically causes the most concentrated and destructive forces at an area of interest. The ropes, however, are protected by the protectors that are designed to  
5 withstand such abuse in accordance with various embodiments.

Other desirable features include a weight of preferably less than 2.5 ounces and flexibility for packing, both of which are important in certain applications, such as backpacking or hauling supplies and equipment long distances. After use, the one or more protectors 90 may be left on the rope 92 when it is coiled up or stuffed in a bag or  
10 backpack as shown in Figure 10. In further embodiments, the protector may have a weight of less than about 5 ounces.

A protector 94 may also be used to protect webbing 96 as shown in Figure 11. In other embodiments, a spiral protector 98 of an embodiment of the invention need not be tight but may be loose with a small continuous gap 99 between the overlapping spiral  
15 segments as shown in Figure 12. This may be the case if the protector is produced via an extrusion process. The protector then may or may not be reversed when coiled around a rope or webbing. In further embodiments, the spiral protector may be configured in a variety of cross sectional shapes (e.g., 100A, 100B, 100C) including squares and rectangles as shown in Figures 10A - 10C for protecting rope and webbing (102A, 102B,  
20 102C respectively). The rectangular shape 100A may be of particular interest for use with webbing 102A.

Protectors of the invention may be used for a wide variety of uses including safety and rescue, military applications, aviation, boating, camping and climbing as well as wide

variety of household uses. Those skilled in the art will appreciate that numerous modifications and variations may be made to the above disclosed embodiments without departing from the spirit and scope of the invention.

What is claimed is: